

## Effectiveness of Milk Production Based on Modernization of its top-priority Factors

I.S. Kozaev<sup>1</sup> and V.I. Dementyev<sup>2</sup>

Federal State Budget-funded Educational Institution of Higher Professional Education “Michurinsk State Agrarian University”, Michurinsk, Russia  
General Director of “Soyuz-Agroplus” Ltd, Sosnovsky District, Tambov region, Russia

doi: <http://dx.doi.org/10.13005/bbra/1527>

(Received: 30 October 2014; accepted: 05 December 2014)

**Milk is the most important staple food, the development of production of which, according to V.I. Lenin, “indicates improvement of well-being and nutrition conditions of the population”<sup>1</sup> and plays the main role in the food security of the country. In the circumstances of market relations, the development of milk production depends on its effectiveness, as there are no capitalists who would work at a loss. Therefore, the problem of effectiveness of milk production has become very important.**

**Key words:** Tambov region, dairy farming, factors and effectiveness of milk production, Economical relations of economic entities, division of total income, modernization of priority factors.

The theory of effectiveness of agricultural production has been studied well enough for 258 years. However, a synthesis of the views of foreign and domestic researchers shows that they do not have a consensus on the criteria, forms, and types of the effectiveness<sup>4</sup>. For example, according to many Russian economists, the effectiveness criterion is the rate of gaining the mass of profit to provide for extensive reproduction. This statement is rather disputable, because effectiveness loses its action mechanisms at simple and recessionary reproduction. Therefore, we agree with the opinion<sup>2</sup>, according to which effectiveness is a utility that indicates the level of feasibility of production and sale of products or services to achieve a set goal.

It is obvious that such understanding of the essence of effectiveness is universal and can be objectively applied to all forms of reproduction.

Effectiveness of milk production, its competitiveness in the food market are closely related to the processes of modernization of the industry.

Modernization is derived from the French word “moderne”, which means “new, modern”. Modernization objectively assumes improvement of a human, society, state, economy, industry both as a whole and its particular countries. However, it requires objective assessment of the validity, need, and effectiveness of the processes taking place in order to determine not only their modernity and innovation, but also their usefulness. For example, in 1992, the government of the Russian Federation identified the large size of collective and state farms as the main reasons for the low effectiveness of agricultural production and decided to modernize

---

\* To whom all correspondence should be addressed.

them through divestiture. Thus, the mixed economy appeared in rural areas, which was to improve the effectiveness and competitiveness of the industry. Our own experience has shown that this modernization failed, since agriculture and especially livestock breeding fell into disrepair, and the economy became more ruinous.

Also, millions of new land owners and tens of millions of hectares of unploughed land started appearing.

There are many other phenomena evidencing the negative effects of modernization. For example, replacement of the government-controlled pricing with the Adam Smith's invisible shaggy hand evidences the presence of "scientific" novelty and negative effect, since domestic

livestock breeding fell into a recession, and the food security was jeopardized.

That is why the processes of modernization of any phenomenon require clear definition of goals and comprehensive assessment of the expected results.

Experience shows that modernization of agricultural production – upgrading, enhancement, and improvement of its economy – is closely linked with the development of industrialization, retooling and modernization, and scientific organization of labor in the economies' system.

Let us consider the results of milk production in the post-modernization period by the agricultural organizations of the Tambov region.

**Table 1.** Dynamics of milk production by agricultural organizations of the Tambov region

Years	Average annual cow population, th. animals	Milk yield per 1 cow, kg	Gross milk production, th. tons	Gain to the precedent year, th. tons	Including due to the change of	
					livestock population	productivity
1990	241.6	2,525	610.1	-	-	-
1991	235.5	2,036	479.6	-130.6	-15.5	-115.1
1992	228.8	2,018	461.8	-17.8	-43.7	-4.7
1993	213.8	2,037	435.6	-26.2	-30.3	-4.2
1994	208.4	1,552	312.6	-123.0	-11.1	-111.0
1995	169.5	1,473	249.7	-62.9	-49.5	-13.5
1996	142.3	1,160	169.7	-80.0	-40.1	-39.9
1997	88.8	1,630	144.8	-24.9	-66.7	41.8
1998	84.9	1,716	145.7	0.9	-6.4	7.3
1999	72.9	1,813	138.2	-7.5	-20.6	13.1
2000	63.4	1,743	113.6	-24.6	-23.3	-1.3
2001	59.5	1,788	108.4	-5.2	-0.9	4.7
2002	53.9	2,088	116.2	7.8	-12.0	19.8
2003	44.9	2,381	106.9	-9.3	-22.5	13.2
2004	37.2	2,519	93.7	-13.2	-18.3	5.1
2005	28.4	2,711	74.0	-19.7	-22.1	4.6
2006	19.9	3,480	69.4	-4.6	-20.1	15.5
2007	14.3	3,993	57.1	-12.3	-19.7	7.4
2008	14.5	3,848	55.8	-1.3	0.8	-0.5
2009	13.4	3,761	50.4	-5.4	-4.3	-1.1
2010	13.0	3,607	46.8	-3.6	-1.5	-2.1
2011	12.4	3,847	47.7	0.9	-2.1	3.0
2012	11.4	3,974	45.3	-2.4	-3.9	6.3

As seen from Table 1, the modernization of dairy farming has led to a decline in the number of cows from 241.6 th.animals in 1990 to 11.4 th.animals in 2012. There was a decrease in total production of milk from 610.1 th.tons to 45.3 th.tons.

70% of the agricultural organizations of the region quit dairy farming completely.

In general, it is clear that in the process of the fake modernization, agricultural organizations lost 564.8 th.tons of milk, including 441.9 th.tons

due to the reduction in the cows' population and 122.9 th.tons due to deterioration in milk productivity.

It is obvious that with a descending recessionary reproduction, effective functioning of dairy farming is hardly possible (Table 2).

**Table 2.** Dynamics of milk sales effectiveness at agricultural organizations of the Tambov region

Years	Prime cost of 1 centner of milk, rub.	Sell price for 1 centner of milk, rub.	Volume of milk sales, th. tons	Milk sale profit (+), loss (-), th.rub.	Level of profitability (+), unprofitability (-), %
1990	43.0	61.0	535.2	9,633.6	41.9
1995	1,130.0	590.0	165.1	-89,154.0	-47.8
2000	440.0	302.0	82.6	-11,398.8	-31.4
2001	529.4	355.5	82.3	-14,311.9	-32.8
2002	540.0	334.2	87.7	-18,048.7	-38.1
2003	554.5	385.1	82.7	-14,009.4	-30.5
2004	650.0	472.6	75.1	-13,322.7	-27.3
2005	698.6	587.0	63.9	-71,312.4	-15.9
2006	695.2	644.8	56.8	-28,627.2	-7.2
2007	780.0	841.8	47.9	2,960.2	7.9
2008	976.3	1,067.3	47.3	4,304.3	9.3
2009	1,022.4	991.0	45.4	-6,974.3	-15.0
2010	1,222.4	1,335.7	41.2	4,688.6	9.3
2011	1,500.8	1,454.7	42.8	-19,730.8	-3.1
2012	1,580.5	1,417.1	40.1	-65,523.4	-10.3

In the course of modernization of the industry, the prime cost of 1 centner of sold milk increased 36.7 times, while the selling price – 23 times. As a result, the dairy business brought a loss of 352.4 million rubles to the agricultural organizations in the region.

This is how the current state of the industry economy, which really needs to be upgraded, looks like.

Experience shows that the processes of milk production modernization are associated with the sources of their funding, which can be formed from own funds, budgets of different levels, and private investment. At the same time, it was observed that both the state and investors invest mainly in new construction, new production selectively and put a lot of agricultural organizations on the sidelines.

This is how the vicious circle is modeled: to improve the effectiveness of the industry, it is necessary to upgrade the infrastructure, and the low effectiveness of the industry hinders its upgrading.

Our research has shown the possibility to upgrade the system of milk production within the existing resource capacity of the agricultural organizations of the Tambov region.

In this case, the aim of the modernization is to increase the effectiveness of milk production based on updating at least three factors of the industry: the fodder supplies, the structure of production, and the economic relations between the milk market entities.

As seen from Table 3, the main internal factor in the industry is fodders, which have the largest share in the cost structure of milk (32.7%).

For modernization of the fodder supplies in order to optimize them, it is necessary to proportionate the share of fodder in the volume of the cow feeding diet with the share of the fodder cost in the total prime cost of the diet's fodders (Table 4).

When optimizing fodder production and rations, one should take into account the interchangeability of different types of fodders, for what it is necessary to determine their impact

**Table 3.** Structure and content of the prime cost of milk production at agricultural organizations of the Tambov region

Years	Expenditures, totally, thousand rub.	Including					
		salaries and emoluments	fodders	electric power	petrochemicals	maintenance of fixed assets	other expenditures
2010	649,139	162,749	208,080	30,058	24,631	95,045	128,579
2011	785,960	221,643	270,593	34,467	37,180	108,143	113,924
2012	764,319	220,499	240,582	30,509	37,306	123,778	111,645
Average for three years	733,136	201,630	239,751	31,677	33,039	108,988	118,049
Structure of expenditures, %	100	27.5	32.7	4.3	4.5	14.8	16.2

**Table 4.** The share of particular fodders in the structure and the prime cost of fodders in the diet of cows with the productivity of 5,000 kg at the agricultural organizations of the Tambov region (at the prime cost of fodders as of 2012)

Types of fodder	Structure of fodders, centners of fodder units	Structure of fodders, %	Prime cost of fodders, rub.	Share of fodders in the prime cost of fodder production, %
Oats	3.5	7.0	1,753.5	6.7
Barley	7.8	15.6	3,907.8	15.0
Pea	2.6	5.2	1,473.9	5.6
Perennial grass hay	11.1	10.0	3,429.9	11.0
Straw	3.3	2.0	33.0	0.1
Silage	55.5	16.0	6,437.5	24.0
Feeding root crops	11.5	2.8	1,409.9	5.4
Annual grass silage	10.9	7.4	1,713.3	6.6
Green mass of perennial grass	77.3	34.0	5,441.9	20.6
Monocalcium phosphate	10	-	1,500.0	5.7
Total	50.0	100.0	27,100.7	100.0

on the prime cost of the fodders. Thus, with the share of hay in the cows' diet equal to 10%, it takes 11.0% in the prime cost of fodders. Accordingly, silage: 16.0 and 24.0, haylage – 7.4 and 6.6, green fodders – 34% and 20.6%. It is evident that hay and silage significantly increase the prime cost of fodders, while hay and green fodders reduce it. Concentrated fodders are in the intermediate position, though, it seems reasonable to use cheaper sunflower cake instead of grain legumes. These dependences and approaches have been taken into account by us in predicting the fodder supplies for the future.

The results of the study of fodder production at the agricultural organizations of the Tambov region give reasons to make the following conclusions:

a) Fodder production is of extensive and multi-component nature, which determines its

inferiority and expensiveness in the current circumstances;

b) The most effective fodder crops are: perennial grasses for green fodder and silage; annual grasses on grain silage; corn for green fodder;

c) The most expensive fodders with account of the large losses during harvesting and storage are all kinds of hay and silage. Concentrated fodders occupy an intermediate position;

d) The problem of usefulness, stability and low price of the fodder supplies or fodder production (if fodders are not purchased) highlights the need to move the industry to using less number of components and using the most effective fodders in dairy farming (Table 5).

**Table 5.** Calculation of the standard annual diet of one cow with the productivity of 5,000 kg and of the cost of the diet at the agricultural organizations of the Tambov region (as of 2012)

Types of fodders	Before modernization		After modernization	
	volume of fodders, centners	prime cost of fodders, rub.	volume of fodders, centners	prime cost of fodders, rub.
Concentrates	13.9	7,135.2	13.9	7,135.2
Perennial grass hay	11.1	3,429.9	-	-
Straw	3.3	33.0	-	-
Silage	55.5	6,437.5	-	-
Feeding beetroot	11.5	1,409.9	-	-
Haylage	10.9	17.3	54.0	8,488.8
Green fodders	77.3	5,441.9	77.3	5,441.9
Monocalcium phosphate, kg	10.0	1,500.0	18.0	2,700.0
The diet contains, centners of fodder units	50.0	27,100.7	50.0	24,765.9

It is indicative that the proposed modernization allows simplifying the organization of the fodder supplies, abandoning the production of expensive and low-quality fodders with high losses during their storage, and reducing the prime cost of the fodders per 1 cow a year by 3,334.8 rubles, which for the entire dairy herd of the agricultural organizations in the region will be equal to 38,140.1 th.rubles.

Modernization of the structure of milk production should be aimed at mitigating the seasonality of its production. It is of great social and economic importance, since it allows to eliminate the deficit in milk production during the cattle stall period, use the beneficial seasonal prices for milk, and gain added value.

As of the end of 2011, according to the State Statistics Agency, agricultural organizations of the region had 1,259 heifers over two years of age, 2,250 heifers over one year of age, 900 of which were 16-17 months old. So, based on full feeding of animals and using free fatty acids, it would be possible to inseminate 2,159 heifers in the first quarter of 2012 with their calving in the fourth quarter of 2012, and receive an additional amount of expensive milk. To do it, 1,259 heifers should have been inseminated in January, 500 in February, 400 in March. They would have calved, accordingly: in October, November, and December of 2012.

And considering that the average yield per cow in 2012 was 3,966 kg of milk, 1,259 first calvers could have produced in October – the first

month of lactation (15 days) – 6.5% of the annual productivity, which for the whole population would be equal to 324.6 tons of milk ( $257.8 * 1,259$ ), in November – the second month of lactation – 14.2% of the annual milk yield, i.e. 709.1 tons ( $563.2 * 1,259$ ), and in December – the third month of lactation – 13.3% of the annual milking cows, i.e. 664.1 tons ( $527.5 * 1,259$ ).

500 first calvers could produce in November (15 days), accordingly: 6.5% and 128.9 tons ( $257.8 * 500$ ), in December – 14.2% and 281.6 tons ( $563.5 * 500$ ); 400 first calvers, accordingly, in December (15 days) – 6.5% and 103.1 tons of milk.

Comparative economic performance of the modernization of the structure of milk production is provided in Table 6.

Calculations show that the algorithm of modernization of the structure of milk production, which we propose, is able to increase the volume of the product by 2 th.tons and its value by 28,808.6 th.rubles.

However, the main external factor of effectiveness of the economic mechanism of the dairy farming operation is pricing. For agricultural producers, the urgent issue is the structure of the retail price of milk, in which their share is unreasonably low. Therefore, the improvement of the system of the industry operation needs to start with upgrading the pricing.

According to [3], the 2000-2006 average purchase price for 1 kg of milk was 4.2 rubles, wholesale sell price – 10.2 rubles, retail price – 14.3 rubles, that is the share of agricultural

**Table 6.** Effectiveness of the structure of modernization of milk production at agricultural organizations of the Tambov region as of 2012

Months	Before modernization			After modernization (forecast)		
	Produced milk, th. tons	Sell price for 1 liter of milk, rub.	Cost of the gross product, th.rub.	Produced milk, th. tons	Sell price for 1 liter of milk, rub.	Cost of the gross product, th.rub.
January	3.2	14.5	46,400.0	3.2	14.5	46,400.0
February	3.1	14.5	44,950.0	3.1	14.5	44,950.0
March	4.0	14.5	58,000.0	4.0	14.5	58,000.0
April	4.0	12.0	48,000.0	4.0	12.0	48,000.0
May	4.4	12.0	52,800.0	4.4	12.0	52,800.0
June	4.7	12.0	56,400.0	4.7	12.0	56,400.0
July	4.4	12.0	52,800.0	4.4	12.0	52,800.0
August	3.9	12.0	46,800.0	3.9	12.0	46,800.0
September	3.5	12.0	42,000.0	3.5	12.0	42,000.0
October	3.2	14.5	46,400.0	3.3	14.5	47,850.0
November	2.8	14.5	40,600.0	3.638	14.5	52,751.0
December	3.2	14.5	46,400.0	4.250	14.5	61,607.6
Total	44.4	13.1	581,550.0	46.388	13.1	610,358.6

organizations of the region in the final price was equal to 29.4%, of the processing organizations – 41.9%, and of the trade organizations – 28.7%.

And in the following years, this trend remained virtually the same (Table 7), though it improved to a certain extent.

Trade organizations earn 4-5 rubles of cash proceeds on every liter of milk, or 2-3 rubles of profit.

Study of the experience of pricing in the industry of the Leningrad region, Krasnodar

region, and a number of other regions shows that the share of agricultural enterprises in the retail price of milk is 50%. And this share will be further increasing. This is indicated by the fact that today, 11.04.2014, JSC “Golitsynskoye” of the Nikiforovsky district of the Tambov region sells milk to the Michurinsk dairy plant at 20 rubles per 1 liter, the wholesale selling price is 30 rubles, and the retail price is 35 rubles. Thus, the share of “Golitsynskoye” in the final price of milk is 57.1%.

**Table 7.** The monthly level of the prices for milk sold by agricultural organizations of the Tambov region as of 2012

Months	Purchase price for 1 kg, rub.	Sell price for 1 liter, rub.	Retail price for 1 liter, rub. <sup>1</sup>	Share of the purchase price in the retail price, %
January	14.5	25.0	30.0	48.3
February	14.5	24.5	30.0	48.3
March	14.5	23.01	30.0	48.3
April	12.0	23.01	28.0	42.8
May	12.0	23.01	28.0	42.8
June	12.0	22.01	26.6	45.1
July	12.0	22.01	26.5	45.3
August	12.0	23.01	27.0	44.4
September	12.0	23.51	27.8	43.1
October	14.5	25.0	30.0	48.3
November	14.5	25.0	30.0	48.3
December	14.5	25.0	30.2	48.0

<sup>1</sup>centners on the average in Tambov and Michurinsk

It is obvious that if in 2012 the share of agricultural organizations in the region were 50% in the cash proceeds from the milk sale, the economy of the sector would be more competitive and positive (Table8).

For example, setting rational proportions of the economic entities in the milk market, increasing the share of agricultural organizations

in the retail price of the product would allow them to increase the cash income by 75.2 million rubles.

The proposed pricing modernization option does not require a single ruble. Only the political will of the government is required to approve the structure of the retail price of milk for 5 years: agricultural organizations - 50%, the processing industry - 30%, and trade - 20%.

**Table 8.** Effectiveness of the modernization of pricing in the market of milk sold by agricultural organizations of the Tambov region as of 2012 (loss of profits)

Months	Actually			After modernization		
	Milk sold, th. tons	Sell price for 1 liter of milk, rub.	Revenue from milk sale, th.rub.	Milk sold, th. tons	Sell price for 1 liter of milk, rub.	Revenue from milk sale, th.rub.
January	3.0	14.5	43.5	3.0	15.0	45.0
February	2.9	14.5	42.0	2.9	15.0	43.5
March	3.0	14.5	52.2	3.6	15.0	54.0
April	3.6	12.0	43.2	3.6	14.0	50.4
May	4.0	12.0	48.0	4.0	14.0	56.0
June	4.2	12.0	50.4	4.2	13.3	55.8
July	4.2	12.0	50.4	4.2	13.2	55.5
August	3.5	12.0	42.0	3.5	13.5	47.2
September	3.3	12.0	39.6	3.3	13.9	45.9
October	3.0	14.5	43.5	3.1	15.0	46.5
November	2.6	14.5	37.7	3.4	15.0	51.8
December	3.0	14.5	43.5	4.0	15.1	60.4
Total	40.9	13.1	536.0	42.8	14.2	611.2

Thus, the purposeful modernization of only three factors of the milk production system will allow agricultural organizations of the Tambov region to increase the added value by 142.1 million rubles without any additional investment based on innovations.

## REFERENCES

1. Lenin, V.I., New data on the laws of development of capitalism in agriculture. Full Collection of Works, Ed. 5, 27. Zhizn I znaniye, 1915; 13-14.
2. Kozhev, I.S., Theoretical aspects of the evaluation of the effectiveness of animal breeding. Bulletin of the Michurinsk State Agricultural University (Scientific and industrial magazine), 2008; **2**: 101.
3. Kozhev, I.S. and V.I. Dementyev, Economic organization mechanism of development of regional animal breeding: theory, methodology, practice. Monograph. Michurinsk – the Science City of Russia, 2007; 291-292.
4. Minakov, I.A. and N.M. Kulakov, Economic organization mechanism of operation of agricultural cooperatives and agricultural formations: Monograph. Tambov: the TGTU Publishing House, 2005; 130.